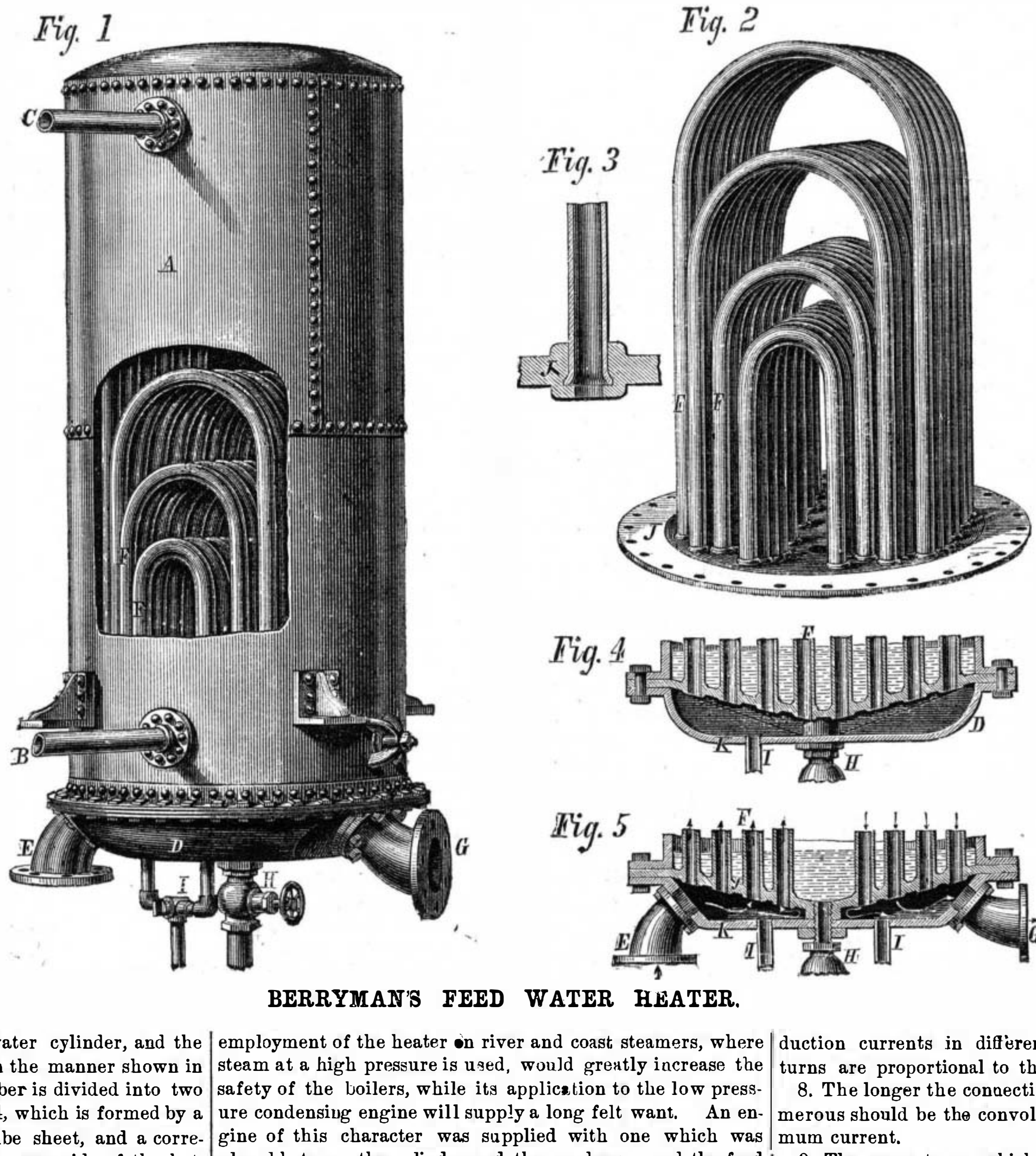
BERRYMAN'S FEED WATER HEATER.

One of the *desiderata* in the economy of the steam engine is the utilization of the heat which is ordinarily carried off by the exhaust steam and wasted. Of many inventive efforts in this direction, we know of none which promises success in so high a degree as the feed water heater which our engravings illustrate. It is the invention of Mr. R. Berryman, of Hartford, Conn., and was patented by him April 9, 1872. It has been in practical use for more than a year in various manufactories where its good qualities have been fully tested, and Government has lately ordered one to be furnished for the purpose of investigating its merits.

Fig. 1 represents the heater with a portion of the shell broken away so as to show the position of the steam pipes within. A is a cylinder which contains the feed water, B being the induction, and C the eduction pipe. The exhaust steam enters one side of the chamber, D, through the pipe, E; it is thence conveyed by the tubes F to the other side of the chamber, and passes out through the pipe, G. H is a blow off cock connected with the feed water cylinder, and at I are two drip pipes, each of which is connected with one side of the exhaust chamber, D. The construction of the water cylinder, which is made strong enough to withstand the working pressure of any steam boiler, will be understood readily from the engraving; that of the steam apparatus we now proceed to explain. Fig. 2 shows the tubes connected with the tube sheet, J. The tubes used are seamless brass of the best quality. They do not pass through the sheet, but rest upon a shoulder formed in boring it, and are there expanded or set up as shown in detail in Fig. 3. A sufficient number of tubes are employed in each heater to obtain an area, in the aggregate, twenty per cent greater than that of the exhaust pipe of the engine for which it is intended. The exhaust chamber, D, is formed by joining the flanges of the tube sheet, J, and plate, K, which latter forms the bottom of the chamber. These two flanges are again joined with the flange on the lower end of the water cylinder, and the three are securely bolted together in the manner shown in Figs. 1, 4 and 5. This exhaust chamber is divided into two spaces by a partition shown in Fig. 4, which is formed by a rib cast on the under side of the tube sheet, and a corresponding rib which projects from the upper side of the bottom plate. In Fig. 5, which is a sectional view taken at a right angle with Fig. 4, are shown the two divisions made by the ribs, and the course (indicated by arrows) which the steam is thereby compelled to take. It will be observed that the tube sheet, J, forms also the bottom of the water cylinder, and that it is made concave on its upper surface. By this construction, the deposits made by the feed water tend to collect at the center, and can readily be blown off from the cock, H, which is connected with the water cylinder by a pipe passing through the exhaust chamber and shown in Figs. 4 and 5. During working hours, the blowing off may be advantageously effected by the pressure exerted by the feed water while being forced through the heater. At other times a hand hole, seen in Fig. 1. can be opened and the bottom cleaned out. The water formed by the condensation of steam in the tubes is carried off by the drip pipes, I, and is not used again under any circumstances on account of the grease contained in it. In some heaters, the feed water is brought into direct contact with the exhaust steam, and, in consequence, becomes charged with the grease employed to lubricate the cylinder. This, when carried into the boiler, has been known to cause burning by allowing the metal to become overheated, besides giving rise to a large consumption of fuel. Further, the steam generated from such water proves very injurious in many branches of manufacture. In woolen mills and dye houses, for this reason, the heater now described is very valuable.

Two heaters may be used, if desired, in combination; in which case the first could be employed solely to heat the feed water for the boilers, and the second to condense the surplus exhaust steam which would pass into it; sufficient water, of course, being drawn from the second heater to keep the temperature low enough for condensation.

Among the advantages claimed by the inventor for this form of heater are the following: The ability of the steam tubes to expand and contract with varying temperatures without causing the damaging strains to which heaters that are constructed with tubes fastened in both heads are subject; the capacity of the heater for containing a large quantity of water, which insures sufficient time for it to become settled and thoroughly heated before being fed to the boiler; the arrangement of the supply pipe and feed pipe (the first being near the bottom of the heater, but far enough distant from the constantly collecting sediment to create no disturbance in it, and the second near the top) which results in supplying the boiler with pure water at a maximum heat; and the facilities for cleansing the heater. He states that the feed water reaches the boiler at a temperature of 212° F., and that this high result is consequent on the large amount of heating surface obtained and the constant passage of the exhaust steam through the tubes, which takes place whether the boiler is being fed or not. There is no place in which the water of condensation can lodge in the tubes, and there is, therefore, no loss of power, which would otherwise be incurred in driving it through them. He thinks the employment of the heater on river and coast steamers, where steam at a high pressure is used, would greatly increase the safety of the boilers, while its application to the low pressure condensing engine will supply a long felt want. An engine of this character was supplied with one which was placed between the cylinder and the condenser, and the feed water was heated by the exhaust steam nearly to the boiling point before the latter entered the condenser. Generally a great saving in fuel and repairs is expected to be gained by the use of the heater.



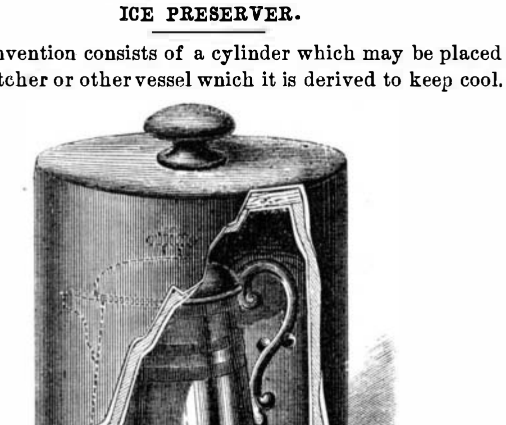
BERRYMAN'S FEED WATER HEATER.

Mr. Berryman is the inventor of other well known machines devised in view of the safe and economical working of steam boilers, some of which have previously been illustrated in the SCIENTIFIC AMERICAN.

Further information may be obtained of the Berryman Manufacturing Company, Hartford, Conn., or at 36 Cortland street, New York city, where the heater may be seen in operation.

ICE PRESERVER.

This invention consists of a cylinder which may be placed over a pitcher or other vessel which it is derived to keep cool.



It is made of straw, woolen or cotton felt, or kindred material, and lined within and covered without with flannel. The inner lining is preferably of white. The top is made of wood to give form to the cylinder, and has a handle for convenience in raising it. Previous to lining with flannel the felt or kindred material, of which the cylinder is made, is coated with shellac or varnish, by which the pores are closed and its utility is increased. A rubber tube around the bottom is an advantage, as it adapts itself to the inequalities of the surface upon which it rests and excludes the air.

Mr. James Dunning, of Bangor, Maine, is the inventor of this improvement, which makes its appearance in good time for the summer demand. There is no doubt its use would prove very economical in the preservation of ice, and water taken from springs or wells, cold enough to be used without ice, might be kept cool much longer by its employment than when exposed in an open vessel. The invention will also serve to keep hot the heated contents of vessels, where it is desirable to apply it to such a purpose.

Volta-Induction.

1. In a secondary closed circuit, the excited induction current is proportional to the current strength in primary circuit.

2. The induction currents arising from the action of a galvanic current upon itself are, both on breaking and making the circuit, equally great, so long as the inducing current strength remains equal.

3. When a metallic closed circuit and a conductor through which an electric current is circulating are either brought nearer each other or separated, a current is induced in the metallic closed circuit. This current is in the reverse direction to that which would have been necessary to effect the approach or separation of itself.

4. The electromotive force which a magnet excites in a helix of wire is, *cœteris paribus*, proportional to the number of convolutions of the wire.

5. The electromotive force which a magnet excites in a surrounding helix is equal, whatever may be the radius of the coil. Therefore, the currents induced in the different rings of wire are inversely proportional to their diameters.

6. The electromotive force excited by a magnet in a helix of a given number of turns is the same, whatever may be the thickness or conducting power of the wire.

7. The strengths of the induction currents in different spirals of equal number of turns are proportional to their conducting powers.

8. The longer the connecting wires are, so much more numerous should be the convolutions in order to obtain a maximum current.

9. The more turns which can be put next to each other close by the magnet or magnetized armature, the fewer turns will be necessary to give a maximum current.

10. The maximum of an induction current is proportional to the strength of the inducing magnet.

11. The retardation of the development of magnetism, in soft iron cores which are wholly covered by helices, depends principally upon the opposite currents induced in the helices themselves. The magnetism of the simultaneous currents induced in the periphery of the core, and the coercive force of the iron, are of less influence.

12. The retardation of the disappearance of the magnetism, from soft iron cores which are wholly covered with galvanic helices, depends, however, principally upon the formation of currents in the periphery of the soft iron cores.

13. The retardation of development and disappearance of magnetism, in soft iron cores which are only partially covered with helices, depends principally upon the magnetic inertia of the iron.

Hydro-Electric Submarine Cable.

M. Ferdinand Tommasi, 69, avenue de l'Alma, Paris, an engineer and inventor of considerable eminence and repute, has just perfected an invention under the above title, which is attracting attention and likely to excite considerable interest. He proposes to employ it for submarine telegraphy, and to substitute, for the ordinary electric conductor, the cable, a simple tube of copper, containing as it were a thread or column of water, which is stated to transmit effectually and instantaneously every impulse communicated by pistons, and not only that, but to permit such impulses to be transmitted in opposite directions at the same time. M. Tommasi's experiments have been conducted upon a limited scale, but he affirms that he can absolutely obtain the following results:—1. A speed of transmission of 600 signals per minute, even at 4000 kilometers distance (nearly 2,500 miles English). 2. Simultaneous exchange of correspondence, any number of despatches being effected at once by the same cable. 3. Adaptability to any recording instrument whatever, the dial, Morse, printing, etc., quite automatically. 4. Economy in first cost, durability, and increase in returns.

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